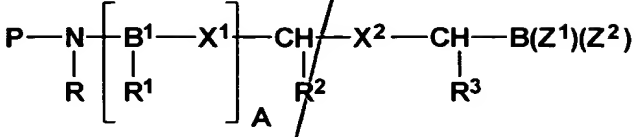
What Is Claimed Is:

1. A compound having the formula:



(1a)

and pharmaceutically acceptable salts thereof;

wherein

P is R^7–C(O)– or R^7–SO_2–, where R^7 is one of aryl, aralkyl, heteroaryl or heteroarylalkyl, the ring portion of any of which can be optionally substituted, or when P is R^7–C(O)–, R^7 can also be N-morpholinyl;

B^1, at each occurrence, is independently one of N or CH;

X^1, at each occurrence, is independently one of –C(O)–NH–, –CH_2–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, –SO_2–NH–, –SO_2–CH_2– or –CH(OH)–CH_2–C(O)–NH–, provided that when B^1 is N, then the X^1 attached to said B^1 is –C(O)–NH–;

X^2 is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, –SO_2–NH–, –SO_2–CH_2– or –CH(OH)–CH_2–C(O)–NH–;

R is hydrogen or alkyl, or R forms together with the adjacent R^1, or when A is zero, forms together with the adjacent R^2, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, that can be optionally substituted by one or two of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy or aryloxy;

R^1, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or –CH_2–R^5, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^2 is one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^5$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^3 is one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^5$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^5, in each instance, is one of aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-W-R^6$, where W is a chalcogen and R^6 is alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

Z^1 and Z^2 are independently one of alkyl, hydroxy, alkoxy, or aryloxy, or together Z^1 and Z^2 form a moiety derived from a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A is 0, 1, or 2.

2. The compound of claim 1, wherein:

A is zero;

X is –C(O)–NH–;

R is hydrogen or C_{1-8}alkyl; and

R_3 is C_{1-6}alkyl.

3. The compound of claim 2, wherein R_3 is C_4alkyl.

4. The compound of claim 1, wherein:

P is $R^7-C(O)-$ or R^7-SO_2-, where R^7 is one of quinolinyl, quinoxalinyl, pyridyl, pyrazinyl, furanyl or pyrrolyl, or when P is $R^7-C(O)-$, R^7 can also be N-morpholinyl.

5. The compound of claim 1, wherein P is one of quinolinecarbonyl, pyridinecarbonyl, quinolinesulfonyl, quinoxalinecarbonyl, quinoxalinesulfonyl, pyrazinecarbonyl, pyrazinesulfonyl, furancarbonyl, furansulfonyl or N-morpholinylcarbonyl.

6. The compound of claim 5, wherein P is one of 8-quinolinecarbonyl, 8-quinolinesulfonyl, 2-quinoxalinecarbonyl, 2-quinoxalinesulfonyl, 2-pyrazinecarbonyl, 2-pyrazinesulfonyl, 3-furancarbonyl, 3-furansulfonyl or N-morpholinecarbonyl.

7. The compound of claim 1, wherein A is 0.

8. The compound of claim 1, wherein B^1, at each occurrence, is CH.

9. The compound of claim 8, wherein X^1, at each occurrence, is –C(O)–NH–.

~~10. The compound of claim 9, wherein X^2 is –C(O)–NH–.~~

11. The compound of claim 1, wherein R is hydrogen or C_{1-8} alkyl.

12. The compound of claim 1, wherein:

R^1, at each occurrence, and R^2 and R^3 are each independently one of hydrogen, C_{1-8} alkyl, C_{3-10} cycloalkyl, C_{6-10} aryl, a 5-, 6-, 9- or 10- membered heteroaryl group, or $–CH_2–R^5$;

R^5, in each instance, is one of C_{6-10}aryl, C_{6-10}ar(C_{1-6})alkyl,C_{1-6}alk(C_{6-10})aryl, C_{3-10}cycloalkyl, C_{1-8}alkoxy, C_{1-8}alkylthio or a 5-, 6-, 9- or 10- membered heteroaryl group;

where the ring portion of any of said aryl, aralkyl, alkaryl or 5-, 6-, 9- or 10- membered heteroaryl groups of R^1, R^2, R^3 and R^5 can be optionally

substituted by one or two substituents independently selected from the group consisting of C_{1-6}alkyl, C_{3-8}cycloalkyl, C_{1-6}alkyl(C_{3-8})cycloalkyl, C_{2-8}alkenyl, C_{2-8}alkynyl, cyano, amino, C_{1-6}alkylamino, di(C_{1-6})alkylamino, benzylamino, dibenzylamino, nitro, carboxy, carbo(C_{1-6})alkoxy, trifluoromethyl, halogen, C_{1-6}alkoxy, C_{6-10}aryl, C_{6-10}aryl(C_{1-6})alkyl, C_{6-10}aryl(C_{1-6})alkoxy, hydroxy, C_{1-6}alkylthio, C_{1-6}alkylsulfinyl, C_{1-6}alkylsulfonyl, C_{6-10}arylthio, C_{6-10}arylsulfinyl, C_{6-10}arylsulfonyl, C_{6-10}aryl, C_{1-6} alkyl(C_{6-10})aryl, and halo(C_{6-10})aryl.

13. The compound of claim 1, wherein R_3 is C_{1-12}alkyl.

14. The compound of claim 1, wherein R_3 is C_{1-6}alkyl.

15. The compound of claim 1, wherein R_3 is C_4alkyl.

16. The compound of claim 1, wherein R^3 is isobutyl.

17. The compound of claim 1, wherein R^2 is one of isobutyl, 1-naphthylmethyl, 2-naphthylmethyl, 3-pyridylmethyl, 2-pyridylmethyl 6-quinolinylmethyl, 3-indolylmethyl, benzyl, 4-fluorobenzyl, 4-hydroxybenzyl, 4-(2'-pyridylmethoxy)benzyl, 4-(benzyloxy)benzyl, benzylnaphthylmethyl or phenethyl.

18. The compound of claim 1, wherein Z^1 and Z^2 are independently ~~one of C_{1-6}alkyl, hydroxy, C_{1-6}alkoxy, or C_{6-10}aryloxy.~~

19. The compound of claim 18, wherein Z^1 and Z^2 are both hydroxy.

20. The compound of claim 1, wherein together Z^1 and Z^2 form a moiety derived from a dihydroxy compound selected from the group consisting

of pinacol, perfluoropinacol, pinanediol, ethylene glycol, diethylene glycol, 1,2-cyclohexanediol, 1,3-propanediol, 2,3-butanediol, glycerol or diethanolamine.

21. The compound of claim 1, wherein:

P is one of quinolinecarbonyl, pyridinecarbonyl, quinolinesulfonyl, quinoxalinecarbonyl, quinoxalinesulfonyl, pyrazinecarbonyl, pyrazinesulfonyl, furancarbonyl, furansulfonyl or N-morpholinylcarbonyl;

A is zero;

X^2 is –C(O)–NH–;

R is hydrogen or C_{1-8} alkyl;

R^2 and R^3 are each independently one of hydrogen, C_{1-8}alkyl, C_{3-10}cycloalkyl, C_{6-10}aryl, C_{6-10}ar(C_{1-6})alkyl, pyridylmethyl, or quinolinylmethyl; and

Z^1 and Z^2 are both hydroxy, C_{1-6}alkoxy, or C_{6-10}aryloxy, or together Z^1 and Z^2 form a moiety derived from a dihydroxy compound selected from the group consisting of pinacol, perfluoropinacol, pinanediol, ethylene glycol, diethylene glycol, 1,2-cyclohexanediol, 1,3-propanediol, 2,3-butanediol, glycerol or diethanolamine.

22. The compound of claim 1, wherein:

P is one of 8-quinolinecarbonyl, 8-quinolinesulfonyl, 2-quinoxalinecarbonyl, 2-quinoxalinesulfonyl, 2-pyrazinecarbonyl, 2-pyrazinesulfonyl, 3-pyridinecarbonyl, 3-pyridinesulfonyl, 3-furancarbonyl, 3-furansulfonyl or N-morpholinecarbonyl;

A is zero;

X^2 is –C(O)–NH–;

R is hydrogen or C_{1-8} alkyl;

R^3 is isobutyl;

R^2 is one of isobutyl, 1-naphthylmethyl, 2-naphthylmethyl, 3-pyridylmethyl, 2-pyridylmethyl 6-quinolinylmethyl, 3-indolylmethyl, benzyl,

4-fluorobenzyl, 4-hydroxybenzyl, 4-(2'-pyridylmethoxy)benzyl, 4-(benzyloxy)benzyl, benzylnaphthylmethyl or phenethyl; and

Z^1 and Z^2 are independently one of hydroxy, C_{1-6}alkoxy, C_{6-10}aryloxy, or together Z^1 and Z^2 form a moiety derived from a dihydroxy compound selected from the group consisting of pinacol, perfluoropinacol, pinanediol, ethylene glycol, diethylene glycol, 1,2-cyclohexanediol, 1,3-propanediol, 2,3-butanediol, glycerol or diethanolamine.

23. The compound of claim 1, wherein said compound is one of:

N-(2-pyrazine)carbonyl-L-phenylalanine-L-leucine boronic acid,

N-(2-quinoline)sulfonyl-L-homophenylalanine-L-leucine boronic acid,

N-(3-pyridine)carbonyl-L-phenylalanine-L-leucine boronic acid,

N-(4-morpholine)carbonyl-L-phenylalanine-L-leucine boronic acid,

N-(4-morpholine)carbonyl-β-(1-naphthyl)-L-alanine-L-leucine boronic acid,

N-(8-quinoline)sulfonyl-β-(1-naphthyl)-L-alanine-L-leucine boronic acid,

N-(4-morpholine)carbonyl-(*O*-benzyl)-L-tyrosine-L-leucine boronic acid,

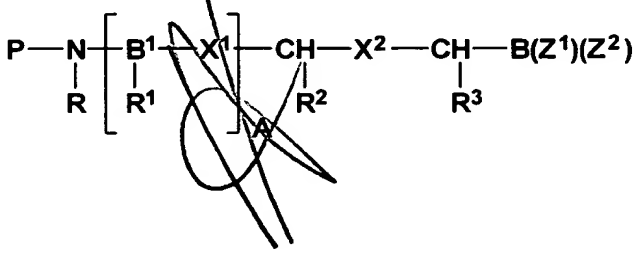
N-(4-morpholine)carbonyl-L-tyrosine-L-leucine boronic acid,

N-(4-morpholine)carbonyl-[*O*-(2-pyridylmethyl)]-L-tyrosine-L-leucine boronic acid;

or isosteres, pharmaceutically acceptable salts or boronate esters thereof.

24. The compound of claim 23, wherein said compound is *N*-(2-pyrazine)carbonyl-L-phenylalanine-L-leucine boronic acid, or an isostere, pharmaceutically acceptable salt or boronate ester thereof.

25. A compound having the formula:



(1a)

wherein

P is hydrogen or an amino-group-protecting moiety;

B^1, at each occurrence, is independently one of N or CH;

X^1, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^1 is N, then the X^1 attached to said B^1 is –C(O)–NH–;

X^2 is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

R is hydrogen or alkyl, or R forms together with the adjacent R^1, or when A is zero, forms together with the adjacent R^2, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, that can be optionally substituted by one or two of keto, hydroxy, aryl, alkoxy or aryloxy;

R^1 at each occurrence, R^2 and R^3 are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^5$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^5, in each instance, is one of aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–W–R^6$, where W is a chalcogen and R^6 is alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

provided that at least one R^1, R^2 or R^3 is naphthylmethyl, pyridylmethyl or quinolinylmethyl;

Z^1 and Z^2 are independently one of alkyl, hydroxy, alkoxy, or aryloxy, or together Z^1 and Z^2 form a moiety derived from a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A is 0, 1, or 2;

provided that the compound is other than isovaleryl-phenylalanine-norvaline-[(naphthylmethyl), (4,4,5,5-tetramethyl-1,3,2-dioxaborolane-2-yl)]methylamide or (3-t-butylsulfonyl)propionyl-norvaline-(1-naphthyl, dihydroxyboryl)methylamide.

26. The compound of claim 25, wherein P is R^7–C(O)–, R^7–SO_2–, R^7–NH–C(O)– or R^7–O–C(O)–, and

R^7 is one of alkyl, aryl, alkaryl, aralkyl, heteroaryl or heteroarylalkyl, any of which can be optionally substituted, or when P is R^7–C(O)–, then R^7 can also be saturated or partially saturated heterocycle.

27. The compound of claim 25, wherein P is R^7–C(O)– or R^7–SO_2–; and

R^7 is one of C_{6-10} aryl, C_{6-10} ar(C_{1-6})alkyl, 5- to 10-membered heteroaryl or 5- to 10-membered heteroaryl(C_{1-6})alkyl, any of which can be optionally substituted, or when P is R^7–C(O)–, R^7 can also be N-morpholinyl.

28. The compound of claim 25, wherein B^1 is CH, and X^1 and X^2 are each –C(O)–NH–.

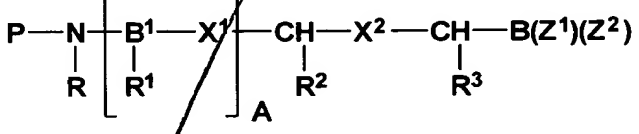
29. The compound of claim 25, wherein R^1 and R^2 are independently selected from the group consisting of alkyl and —CH_2—R^5, where R^5 is one of C_{6-10} aryl, C_{1-10} alk(C_{6-10})aryl, C_{3-10} cycloalkyl, or a 5-, 6-, 9- or 10-membered heterocycle.

30. The compound of claim 25, wherein A is zero.

31. The compound of claim 25, wherein R^2 is quinolinylmethyl.

32. The compound of claim 25, wherein said compound is one of:
N-(4-morpholine)carbonyl-β-(1-naphthyl)-L-alanine-L-leucine boronic acid, or
N-(8-quinoline)sulfonyl-β-(1-naphthyl)-L-alanine-L-leucine boronic acid;
or isosteres, pharmaceutically acceptable salts or boronate esters thereof.

33. A compound having the formula:



(1a)

and pharmaceutically acceptable salts thereof;
wherein
P is hydrogen or an amino-group-protecting moiety;
B^1, at each occurrence, is independently one of N or CH;
X^1, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^1 is N, then the X^1 attached to said B^1 is –C(O)–NH–;
X^2 is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;
R forms together with the adjacent R^1, or when A is zero, forms together with the adjacent R^2, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, and one or two optional substituents selected from the group consisting of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy and aryloxy;
when A is 2, the R^1 that is not adjacent to N–R is one of hydrogen, alkyl, cycloalkyl, aryl, a 5- to 10-membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^5$;

when A is 1 or 2, R^2 is one of hydrogen, alkyl, cycloalkyl, aryl, a 5- to 10-membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^5$;

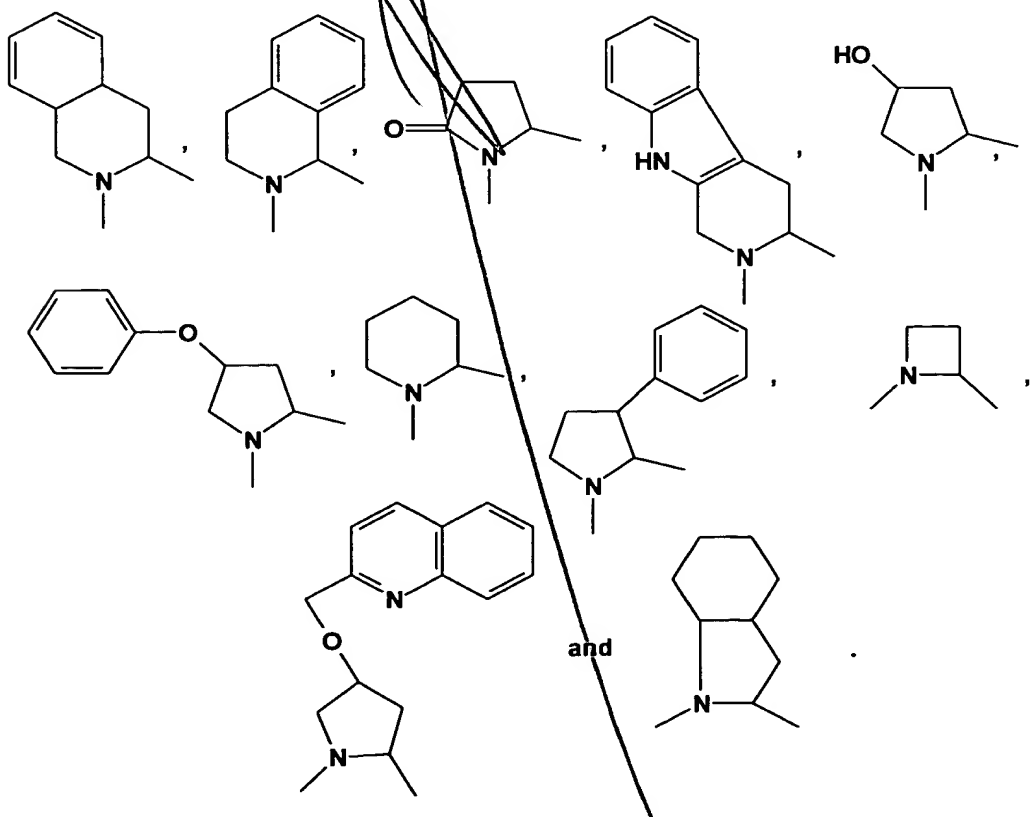
R^3 is one of hydrogen, alkyl, cycloalkyl, aryl, a 5- to 10-membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^5$;

R^5, in each instance, is independently one of aryl, aralkyl, alkaryl, cycloalkyl, a 5- to 10-membered saturated, partially unsaturated or aromatic heterocycle or $-W-R^6$, where W is a chalcogen and R^6 is alkyl;

Z^1 and Z^2 are independently one of alkyl, hydroxy, alkoxy, or aryloxy, or together Z^1 and Z^2 form a moiety derived from a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A is 0, 1, or 2.

34. The compound of claim 33, wherein the nitrogen-containing ring system is selected from the group consisting of:



35. The compound of claim 33, wherein P is R^7–C(O)–, R^7–SO_2–, R^7–NH–C(O)– or R^7–O–C(O)–, and

R^7 is one of alkyl, aryl, alkaryl, aralkyl, heteroaryl or heteroarylalkyl, any of which can be optionally substituted, or when P is R^7–C(O)–, then R^7 can also be saturated or partially saturated heterocycle.

36. The compound of claim 35, wherein P is R^7–C(O)– or R^7–SO_2–; and

R^7 is one of C_{6-10} aryl, C_{6-10} ar(C_{1-6})alkyl, 5- to 10-membered heteroaryl or 5- to 10-membered heteroaryl(C_{1-6})alkyl, any of which can be optionally substituted, or when P is R^7–C(O)–, R^7 can also be N-morpholinyl.

37. The compound of claim 33, wherein B^1 is CH, and X^1 and X^2 are each –C(O)–NH–.

38. The compound of claim 33, wherein R^1 and R^2 are independently selected from the group consisting of alkyl and —CH_2—R^5, where

R^5, in each instance, is one of C_{6-10} aryl, C_{6-10} ar(C_{1-6})alkyl,C_{1-6} alk(C_{6-10})aryl, C_{3-10} cycloalkyl, C_{1-8} alkoxy, C_{1-8} alkylthio or a 5-, 6-, 9- or 10-membered heteroaryl group, where the ring portion of any of said C_{6-10} aryl, C_{6-10} ar(C_{1-6})alkyl,C_{1-6} alk(C_{6-10})aryl, or 5-, 6-, 9- or 10- membered heteroaryl can be optionally substituted by one or two substituents independently selected from the group consisting of C_{1-6} alkyl, C_{3-8} cycloalkyl, C_{1-6}alkyl(C_{3-8})cycloalkyl, C_{2-8} alkenyl, C_{2-8} alkynyl, cyano, amino, C_{1-6} alkylamino, di(C_{1-6})alkylamino, benzylamino, dibenzylamino, nitro, carboxy, carbo(C_{1-6})alkoxy, trifluoromethyl, halogen, C_{1-6} alkoxy, C_{6-10} aryl, C_{6-10} aryl(C_{1-6})alkyl, C_{6-10} aryl(C_{1-6})alkoxy, hydroxy, C_{1-6} alkylthio, C_{1-6} alkylsulfinyl, C_{1-6} alkylsulfonyl, C_{6-10} arylthio, C_{6-10} arylsulfinyl, C_{6-10} arylsulfonyl, C_{6-10}aryl, C_{1-6} alkyl(C_{6-10})aryl and halo(C_{6-10})aryl.

39. The compound of claim 33, wherein A is zero.

40. The compound of claim 33, wherein P is hydrogen.

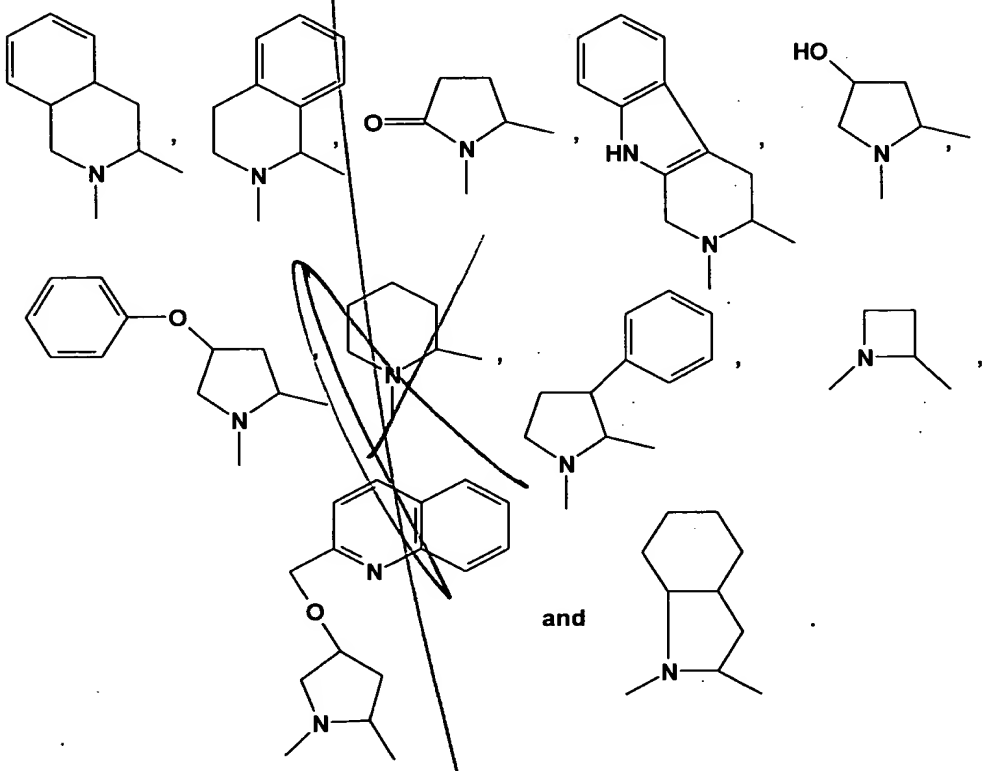
41. The compound of claim 33,wherein:

A is zero;

P is hydrogen;

X^2 is –C(O)–NH–;

R forms together with the adjacent R^2, a nitrogen-containing ring system selected from the group consisting of:



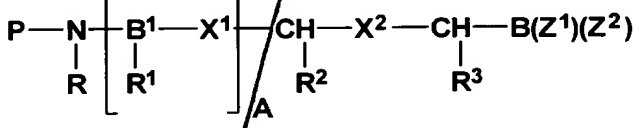
R^3 is C_{1-6}alkyl; and

Z^1 and Z^2 are both hydroxy, C_{1-6}alkoxy, or C_{6-10}aryloxy, or together Z^1 and Z^2 form a moiety derived from a dihydroxy compound selected from the group consisting of pinacol, perfluoropinacol, pinanediol, ethylene glycol, diethylene

glycol, 1,2-cyclohexanediol, 1,3-propanediol, 2,3-butanediol, glycerol or diethanolamine.

42. The compound of claim 33, wherein said compound is L-proline-L-leucine boronic acid, or isosteres, pharmaceutically acceptable salts or boronate esters thereof.

43. A compound having the formula:



(1a)

and pharmaceutically acceptable salts thereof;

wherein

P is hydrogen or an amino-group-protecting moiety;

B^1, at each occurrence, is independently one of N or CH;

X^1, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^1 is N, then the X^1 attached to said B^1 is –C(O)–NH–;

X^2 is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

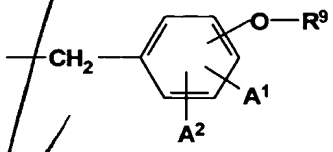
R is hydrogen or alkyl, or R forms together with the adjacent R^1, or when A is zero, forms together with the adjacent R^2, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, and one or two optional substituents selected from the group consisting of keto, hydroxy, aryl, alkoxy and aryloxy;

R^1 at each occurrence, R^2 and R^3 are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or

aromatic heterocycle or $-CH_2-R^5$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^5, in each instance, is one of aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-W-R^6$, where W is a chalcogen and R^6 is alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

provided that at least one R^1, R^2 or R^3 is



where R^9 is one of hydrogen, alkyl, cycloalkyl, aryl, aralkyl, heteroaryl or heteroarylalkyl; wherein the alkyl is optionally substituted with one of C_{1-6} alkyl, halogen monohalo(C_{1-6})alkyl and trifluoromethyl; and wherein said cycloalkyl, aryl, aralkyl, heteroaryl and heteroarylalkyl groups can be optionally substituted with one or two of C_{1-6} alkyl, C_{3-8} cycloalkyl, C_{1-6} alkyl(C_{3-8})cycloalkyl, C_{2-8} alkenyl, C_{2-8} alkynyl, cyano, amino, C_{1-6} alkylamino, di(C_{1-6})alkylamino, benzylamino, dibenzylamino, nitro, carboxy, carbo(C_{1-6})alkoxy, trifluoromethyl, halogen, C_{1-6} alkoxy, C_{6-10} aryl, C_{6-10} aryl(C_{1-6})alkyl, C_{6-10} aryl(C_{1-6})alkoxy, hydroxy, C_{1-6} alkylthio, C_{1-6} alkylsulfinyl, C_{1-6} alkylsulfonyl, C_{6-10} arylthio, C_{6-10} arylsulfinyl, C_{6-10} arylsulfonyl, C_{6-10} aryl, C_{1-6} alkyl(C_{6-10})aryl, and halo(C_{6-10})aryl;

A^1 and A^2 are independently one of hydrogen, halogen, C_{1-6} alkyl, monohalo(C_{1-6})alkyl, or trifluoromethyl;

Z^1 and Z^2 are independently one of alkyl, hydroxy, alkoxy, or aryloxy, or together Z^1 and Z^2 form a moiety derived from a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain

or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A is 0, 1, or 2.

44. The compound of claim 43, wherein P is R^7–C(O)–, R^7–SO_2–, R^7–NH–C(O)– or R^7–O–C(O)–, and

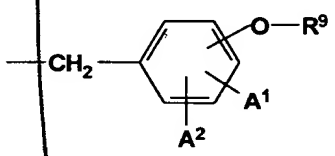
R^7 is one of alkyl, aryl, alkaryl, aralkyl, heteroaryl or heteroarylalkyl, any of which can be optionally substituted, or when P is R^7–C(O)–, then R^7 can also be saturated or partially saturated heterocycle.

45. The compound of claim 43, wherein P is R^7–C(O)– or R^7–SO_2–; and

R^7 is one of C_{6-10} aryl, C_{6-10} ar(C_{1-6})alkyl, 5- to 10-membered heteroaryl or 5- to 10-membered heteroaryl(C_{1-6})alkyl, any of which can be optionally substituted, or when P is R^7–C(O)–, R^7 can also be N-morpholinyl.

46. The compound of claim 43, wherein X^1 and X^2 are each –C(O)–NH–.

47. The compound of claim 43, wherein one of R^1, R^2 or R^3 is



where

A^1 and A^2 are independently one of hydrogen, C_{1-6} alkyl, halogen, monohalo (C_{1-6}) alkyl or trifluoromethyl;

R^9 is one of C_{1-8} alkyl, C_{3-10} cycloalkyl, C_{6-10} aryl, C_{6-10} ar(C_{1-6})alkyl, a 5- to 10-membered heteroaryl or a 5- to 10-membered heteroaryl(C_{1-6})alkyl;

and the remaining R^1, R^2 and R^3 are independently selected from the group consisting of alkyl and —CH_2—R^5, where

R^5, in each instance, is one of C_{6-10} aryl, C_{6-10} ar(C_{1-6})alkyl,C_{1-6} alk(C_{6-10})aryl, C_{3-10} cycloalkyl, C_{1-8} alkoxy, C_{1-8} alkylthio or a 5-, 6-, 9- or 10-membered heteroaryl group, where the ring portion of any of said C_{6-10} aryl, C_{6-10} ar(C_{1-6})alkyl,C_{1-6} alk(C_{6-10})aryl, or 5-, 6-, 9- or 10- membered heteroaryl can be optionally substituted by one or two substituents independently selected from the group consisting of C_{1-6} alkyl, C_{3-8} cycloalkyl, C_{1-6} alkyl(C_{3-8})cycloalkyl, C_{2-8} alkenyl, C_{2-8} alkynyl, cyano, amino, C_{1-6} alkylamino, di(C_{1-6})alkylamino, benzylamino, dibenzylamino, nitro, carboxy, carbo(C_{1-6})alkoxy, trifluoromethyl, halogen, C_{1-6} alkoxy, C_{6-10} aryl, C_{6-10} aryl(C_{1-6})alkyl, C_{6-10} aryl(C_{1-6})alkoxy, hydroxy, C_{1-6} alkylthio, C_{1-6} alkylsulfinyl, C_{1-6} alkylsulfonyl, C_{6-10} arylthio, C_{6-10} arylsulfinyl, C_{6-10} arylsulfonyl, C_{6-10}aryl, C_{1-6} alkyl(C_{6-10})aryl and halo(C_{6-10})aryl.

48. The compound of claim 43, wherein A is zero.

49. The compound of claim 43, wherein:

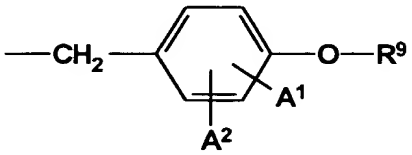
A is zero;

P is one of R^7–C(O)–, R^7–SO_2–, R^7–NH–C(O)– or R^7–O–C(O)–;

R^7 is one of quinolinyl, quinoxalinyl, pyridyl, pyrazinyl, furanyl or pyrrolyl, or when P is R^7–C(O)–, R^7 can also be N-morpholinyl;

X^2 is –C(O)–NH–;

R^2 is:



where

A^1 and A^2 are independently one of hydrogen, C_{1-6} alkyl, halogen, monohalo (C_{1-6}) alkyl or trifluoromethyl;

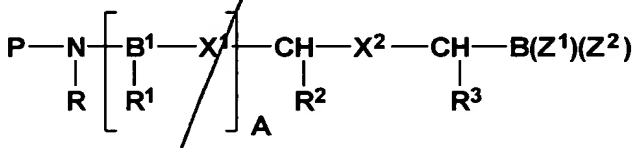
R^9 is one of hydrogen, C_{1-8}alkyl, phenyl, benzyl, phenethyl or pyridylmethyl;

R^3 is C_{1-6}alkyl; and

Z^1 and Z^2 are both hydroxy, C_{1-6}alkoxy, or C_{6-10}aryloxy, or together Z^1 and Z^2 form a moiety derived from a dihydroxy compound selected from the group consisting of pinacol, perfluoropinacol, pinanediol, ethylene glycol, diethylene glycol, 1,2-cyclohexanediol, 1,3-propanediol, 2,3-butanediol, glycerol or diethanolamine.

50. The compound of claim 43, wherein said compound is one of:
N-(4-morpholine)carbonyl-(*O*-benzyl)-L-tyrosine-L-leucine boronic acid,
N-(4-morpholine)carbonyl-L-tyrosine-L-leucine boronic acid, or
N-(4-morpholine)carbonyl-[*O*-(2-pyridylmethyl)]-L-tyrosine-L-leucine boronic acid; or
isosteres, pharmaceutically acceptable salts or boronate esters thereof.

51. A compound having the formula:



(1a)

and pharmaceutically acceptable salts thereof;
wherein

A is zero;

P is hydrogen or an amino-group-protecting moiety;

X^2 is one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

R is hydrogen or alkyl, or R forms together with the adjacent R^2, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring

system having 4-14 ring members, where said ring system can be optionally substituted by one or two of keto, hydroxy, aryl, alkoxy or aryloxy;

R^2 and R^3 are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^5$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^5, in each instance, is one of aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-W-R^6$, where W is a chalcogen and R^6 is alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted; and

Z^1 and Z^2 are independently one of alkyl, hydroxy, alkoxy, or aryloxy, or together Z^1 and Z^2 form a moiety derived from a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O;

provided that P is not C_{1-6} alkoxycarbonyl, C_{1-4} alkylcarbonyl or phenyl(C_{1-3})alkyl.

52. The compound of claim 51, wherein P is $R^7-C(O)-$, R^7-SO_2-, $R^7-NH-C(O)-$ or $R^7-O-C(O)-$, and

R^7 is one of alkyl, aryl, alkaryl, aralkyl, heteroaryl or heteroarylalkyl, where the ring portion of any of said aryl, alkaryl, aralkyl, heteroaryl or heteroarylalkyl can be optionally substituted, or when P is $R^7-C(O)-$, then R^7 can also be a saturated or partially unsaturated heterocycle.

53. The compound of claim 51, wherein P is $R^7-C(O)-$ or R^7-SO_2-; and

R^7 is one of C_{6-10} aryl, C_{6-10} ar(C_{1-6})alkyl, a 5- to 10-membered heteroaryl or a 5- to 10-membered heteroaryl(C_{1-6})alkyl, any of which can be optionally substituted, or when P is R^7–C(O)–, R^7 can also be N-morpholinyl.

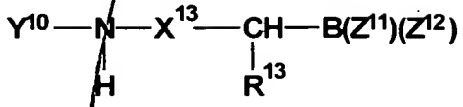
54. The compound of claim 51, wherein B^1 is CH, and X^1 and X^2 are each –C(O)–NH–.

55. The compound of claim 51, wherein R^2 and R^3 are independently selected from the group consisting of C_{1-8} alkyl and —CH_2—R^5, where R^5 is one of C_{6-10} aryl, C_{1-6} alk(C_{6-10})aryl, C_{6-10} ar(C_{1-6})alkyl, C_{3-8} cycloalkyl, or a 5-, 6-, 9- or 10-membered heterocycle.

56. The compound of claim 51, which is *N*-(3-phenylpropionyl)-L-phenylalanine-L-leucine boronic acid, or isosteres, pharmaceutically acceptable salts or boronate esters thereof.

57. The compound of claim 51, wherein said compound is one of:
N-(2-pyrazine)carbonyl-L-phenylalanine-L-leucine boronic acid,
N-(2-quinoline)sulfonyl-L-homophenylalanine-L-leucine boronic acid,
N-(3-pyridine)carbonyl-L-phenylalanine-L-leucine boronic acid,
N-(4-morpholine)carbonyl-L-phenylalanine-L-leucine boronic acid,
N-(4-morpholine)carbonyl-β-(1-naphthyl)-L-alanine-L-leucine boronic acid,
N-(8-quinoline)sulfonyl-β-(1-naphthyl)-L-alanine-L-leucine boronic acid,
N-(4-morpholine)carbonyl-(*O*-benzyl)-L-tyrosine-L-leucine boronic acid,
N-(4-morpholine)carbonyl-L-tyrosine-L-leucine boronic acid, or
N-(4-morpholine)carbonyl-[*O*-(2-pyridylmethyl)]-L-tyrosine-L-leucine boronic acid; or
isosteres, pharmaceutically acceptable salts or boronate esters thereof.

58. A compound having the formula:



(2a)

and pharmaceutically acceptable salts thereof;

wherein

Y is one of R^8–C(O)–, R^8–SO_2–, R^8–NH–C(O)– or R^8–O–C(O)–, where R^8 is one of alkyl, aryl, alkaryl, aralkyl, any of which can be optionally substituted, or when Y is R^8–C(O)– or R^8–SO_2–, then R^8 can also be an optionally substituted 5-10 membered, saturated, partially unsaturated or aromatic heterocycle;

X^3 is a covalent bond or –C(O)–CH_2–;

R^3 is one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or –CH_2–R^5, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^5, in each instance, is one of aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or –W–R^6, where W is a chalcogen and R^6 is alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted; and

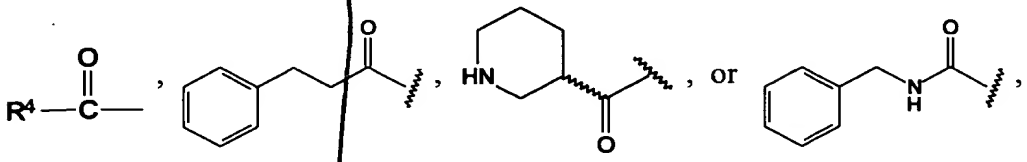
Z^1 and Z^2 are independently alkyl, hydroxy, alkoxy, aryloxy, or together form a moiety derived from dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O;

provided that when Y is R^8–C(O)–, R^8 is other than phenyl, benzyl or C_{1-3} alkyl.

59. The compound of claim 58, wherein P is R^8–C(O)– or R^8–SO_2–; and

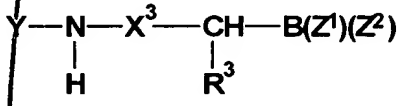
R^8 is one of C_{6-10} aryl, C_{6-10} ar(C_{1-6})alkyl, or a 5-10 membered heteroaryl, any of which can be optionally substituted, or when P is R^8–C(O)–, R^8 can also be N-morpholinyl.

60. The compound according to claim 58, wherein Y is one of



where R^4 is C_{6-12} alkyl.

61. A compound having the formula:

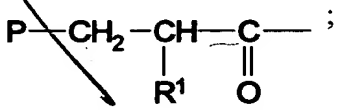


(2a)

and pharmaceutically acceptable salts thereof;

where

Y is



(3a)

P is one of R^7–C(O)–, R^7–SO_2–, R^7–NH–C(O)– or R^7–O–C(O)–, where R^7 is one of alkyl, aryl, alkaryl, aralkyl, any of which can be optionally substituted, or when Y is R^7–C(O)– or R^7–SO_2–, R^7 can also be an optionally substituted 5-10 membered saturated, partially unsaturated or aromatic heterocycle;

X^3 is a covalent bond or –C(O)–CH_2–;

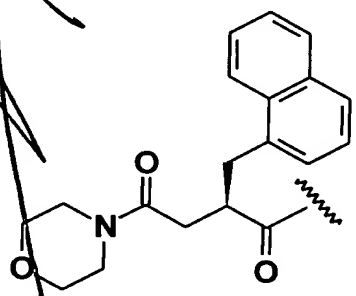
R^1, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or –CH_2–R^5, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^3 is one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^5$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^5, in each instance, is one of aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-W-R^6$, where W is a chalcogen and R^6 is alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted; and

Z^1 and Z^2 are independently alkyl, hydroxy, alkoxy, aryloxy, or together form a moiety derived from dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O.

62. The compound of claim 61, wherein Y is:



63. A pharmaceutical composition, comprising a compound of claims 1, 25, 33, 43, 51, 58 or 61, or a pharmaceutically acceptable salt thereof, and a pharmaceutically acceptable carrier or diluent.

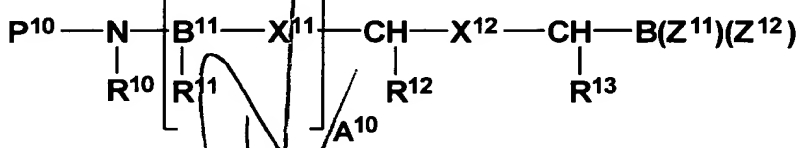
64. A pharmaceutical composition, comprising a compound of claims 22, 28, 41, 49, 55, 60 and 62, or a pharmaceutically acceptable salt thereof, and a pharmaceutically acceptable carrier or diluent.

65. A pharmaceutical composition, comprising a compound of claims 23, 32, 42, 50, 56 and 57 or an isostere, pharmaceutically acceptable salt or boronate ester thereof, and a pharmaceutically acceptable carrier or diluent.

66. The pharmaceutical composition of claim 65, wherein said compound is present in an amount effective to inhibit the proteasome function in a mammal.

67. A method of inhibiting the growth of a cancer cell, comprising contacting a cell in need of such inhibiting with an effective growth-inhibiting amount of a compound of claims 1, 25, 33, 43, 51, 58 or 61.

68. A method for reducing the rate of muscle protein degradation in a cell comprising contacting a cell in need of said reducing with an effective amount of a proteasome inhibitor of the formula:



(1b)

or a pharmaceutically acceptable salt thereof;

wherein

P^{10} is hydrogen or an amino-group-protecting moiety;

B^{11} is independently one of N or CH;

X^{11}, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^{11} is N, then X^{11} is –C(O)–NH;

X^{12} is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

R^{10} is hydrogen or alkyl, or R^{10} forms together with the adjacent R^{11}, or when A^{10} is zero, forms together with the adjacent R^{12}, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, that can be optionally substituted by one or two of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy or aryloxy;

R^{11}, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

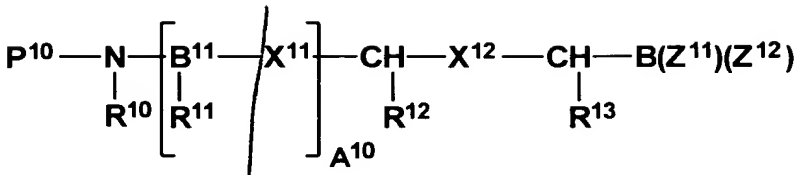
R^{12} and R^{13} are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

where R^{15} is aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle, or –chalcogen–alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

Z^{11} and Z^{12} are independently alkyl, hydroxy, alkoxy, aryloxy, or Z^{11} and Z^{12} together form a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A^{10} is 0, 1, or 2

69. A method for reducing the activity of NF-κB in a cell, comprising contacting a cell in need of said reducing with an effective amount of a proteasome inhibitor of the formula:



(1b)

or a pharmaceutically acceptable salt thereof;

wherein

P^{10} is hydrogen or an amino-group-protecting moiety;

B^{11} is independently one of N or CH;

X^{11}, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^{11} is N, then X^{11} is –C(O)–NH;

X^{12} is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

R^{10} is hydrogen or alkyl, or R^{10} forms together with the adjacent R^{11}, or when A^{10} is zero, forms together with the adjacent R^{12}, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, that can be optionally substituted by one or two of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy or aryloxy;

R^{11}, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^{12} and R^{13} are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

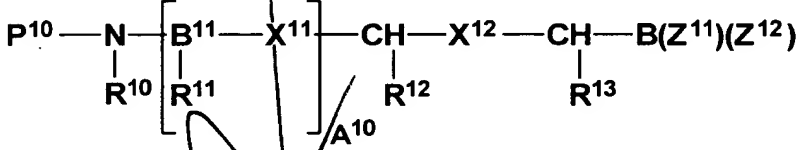
where R^{15} is aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle, or

–chalcogen–alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

Z^{11} and Z^{12} are independently alkyl, hydroxy, alkoxy, aryloxy, or Z^{11} and Z^{12} together form a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A^{10} is 0, 1, or 2.

70. A method for reducing the rate of intracellular protein breakdown, comprising contacting cells in need of said reducing with an effective amount of a proteasome inhibitor of the formula:



(1b)

or a pharmaceutically acceptable salt thereof;

wherein

P^{10} is hydrogen or an amino-group-protecting moiety;

B^{11} is independently one of N or CH;

X^{11}, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^{11} is N, then X^{11} is –C(O)–NH;

X^{12} is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

R^{10} is hydrogen or alkyl, or R^{10} forms together with the adjacent R^{11}, or when A^{10} is zero, forms together with the adjacent R^{12}, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14

ring members, that can be optionally substituted by one or two of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy or aryloxy;

R^{11}, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

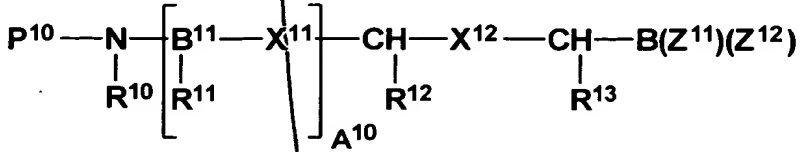
R^{12} and R^{13} are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

where R^{15} is aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle, or –chalcogen–alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

Z^{11} and Z^{12} are independently alkyl, hydroxy, alkoxy, aryloxy, or Z^{11} and Z^{12} together form a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A^{10} is 0, 1, or 2.

71. A method for reducing the rate of degradation of p53 protein in a cell, comprising administering to a cell in need of said reducing an effective amount of a proteasome inhibitor of the formula:



(1b)

or a pharmaceutically acceptable salt thereof;

wherein

P^{10} is hydrogen or an amino-group-protecting moiety;

B^{11} is independently one of N or CH;

X^{11}, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH $–NH_2$–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^{11} is N, then X^{11} is –C(O)–NH;

X^{12} is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

R^{10} is hydrogen or alkyl, or R^{10} forms together with the adjacent R^{11}, or when A^{10} is zero, forms together with the adjacent R^{12}, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, that can be optionally substituted by one or two of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy or aryloxy;

R^{11}, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

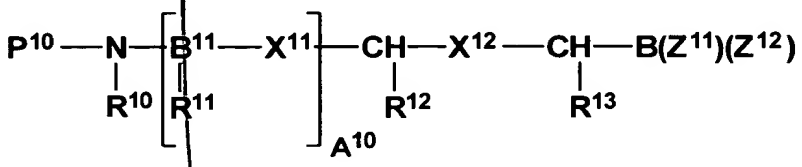
R^{12} and R^{13} are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

where R^{15} is aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle, or –chalcogen–alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

Z^{11} and Z^{12} are independently alkyl, hydroxy, alkoxy, aryloxy, or Z^{11} and Z^{12} together form a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A^{10} is 0, 1, or 2.

72. A method for inhibiting cyclin degradation in a cell, comprising contacting a cell in need of said reducing with an effective amount of a proteasome inhibitor of the formula:



(1b)

or a pharmaceutically acceptable salt thereof;

wherein

P^{10} is hydrogen or an amino-group-protecting moiety;

B^{11} is independently one of N or CH;

X^{11}, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^{11} is N, then X^{11} is –C(O)–NH;

X^{12} is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

R^{10} is hydrogen or alkyl, or R^{10} forms together with the adjacent R^{11}, or when A^{10} is zero, forms together with the adjacent R^{12}, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, that can be optionally substituted by one or two of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy or aryloxy;

R^{11}, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^{12} and R^{13} are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or

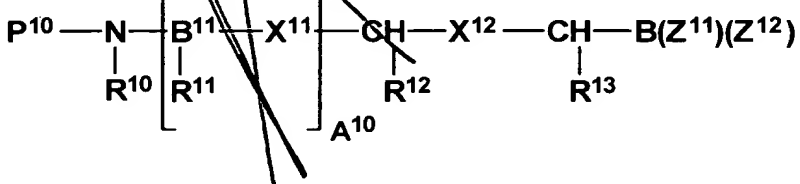
$-CH_2-R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

where R^{15} is aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle, or –chalcogen–alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

Z^{11} and Z^{12} are independently alkyl, hydroxy, alkoxy, aryloxy, or Z^{11} and Z^{12} together form a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A^{10} is 0, 1, or 2.

73. A method of preventing or treating an inflammatory condition in a patient in need thereof, said method comprising administering to said patient a proteasome inhibitor of the formula:



(1b)

or a pharmaceutically acceptable salt thereof;

wherein

P^{10} is hydrogen or an amino-group-protecting moiety;

B^{11} is independently one of N or CH;

X^{11}, at each occurrence, is independently one of $-C(O)-NH-$, $-CH_2-NH-$, $-CH(OH)-CH_2-$, $-CH(OH)-CH(OH)-$, $-CH(OH)-CH_2-NH-$, $-CH=CH-$, $-C(O)-CH_2-$, $-SO_2-NH-$, $-SO_2-CH_2-$ or $-CH(OH)-CH_2-C(O)-NH-$, provided that when B^{11} is N, then X^{11} is $-C(O)-NH$;

X^{12} is one of $-C(O)-NH-$, $-CH(OH)-CH_2-$, $-CH(OH)-CH(OH)-$, $-C(O)-CH_2-$, $-SO_2-NH-$, $-SO_2-CH_2-$ or $-CH(OH)-CH_2-C(O)-NH-$;

R^{10} is hydrogen or alkyl, or R^{10} forms together with the adjacent R^{11}, or when A^{10} is zero, forms together with the adjacent R^{12}, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, that can be optionally substituted by one or two of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy or aryloxy;

R^{11}, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^{12} and R^{13} are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

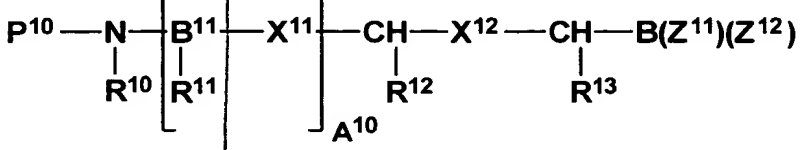
where R^{15} is aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle, or –chalcogen–alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

Z^{11} and Z^{12} are independently alkyl, hydroxy, alkoxy, aryloxy, or Z^{11} and Z^{12} together form a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A^{10} is 0, 1, or 2.

74. The method of claim 73, wherein said patient has been diagnosed with, or is at risk of developing, a condition selected from the group consisting of tissue rejection, organ rejection, arthritis, an infection, dermatoses, inflammatory bowel disease, and an autoimmune disease.

75. A method for inhibiting antigen presentation in a cell comprising administering to a cell in need thereof an effective amount of a proteasome inhibitor of the formula:



(1b)

or a pharmaceutically acceptable salt thereof;

wherein

P^{10} is hydrogen or an amino-group-protecting moiety;

B^{11} is independently one of N or CH;

X^{11}, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^{11} is N, then X^{11} is –C(O)–NH;

X^{12} is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

R^{10} is hydrogen or alkyl, or R^{10} forms together with the adjacent R^{11}, or when A^{10} is zero, forms together with the adjacent R^{12}, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, that can be optionally substituted by one or two of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy or aryloxy;

R^{11}, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

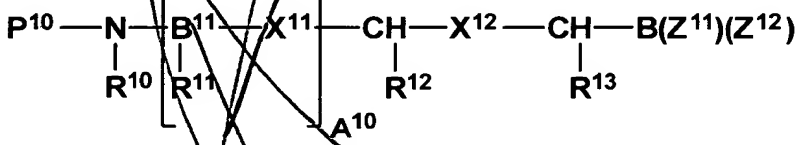
R^{12} and R^{13} are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

where R^{15} is aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle, or –chalcogen–alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

Z^{11} and Z^{12} are independently alkyl, hydroxy, alkoxy, aryloxy, or Z^{11} and Z^{12} together form a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A^{10} is 0, 1, or 2.

76. A method for inhibiting inducible NF-κB dependent cell adhesion in an animal in need of said inhibiting, comprising administering to said animal an effective amount of a proteasome inhibitor of the formula:



(1b)

or a pharmaceutically acceptable salt thereof;

wherein

P^{10} is hydrogen or an amino-group-protecting moiety;

B^{11} is independently one of N or CH;

X^{11}, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH_2–NH–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^{11} is N, then X^{11} is –C(O)–NH;

X^{12} is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

R^{10} is hydrogen or alkyl, or R^{10} forms together with the adjacent R^{11}, or when A^{10} is zero, forms together with the adjacent R^{12} a nitrogen-containing

mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, that can be optionally substituted by one or two of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy or aryloxy;

R^{11}, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

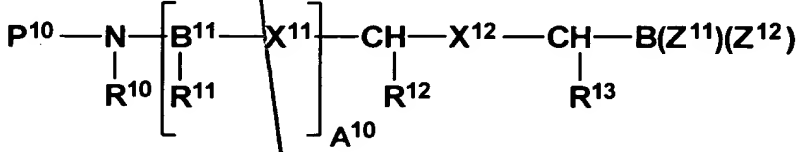
R^{12} and R^{13} are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $-CH_2-R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

where R^{15} is aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle, or –chalcogen–alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

Z^{11} and Z^{12} are independently alkyl, hydroxy, alkoxy, aryloxy, or Z^{11} and Z^{12} together form a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A^{10} is 0, 1, or 2.

77. A method for inhibiting HIV replication in an animal in need of said inhibiting, comprising administering to said animal an effective amount of a proteasome inhibitor of the formula:



(1b)

or a pharmaceutically acceptable salt thereof;

wherein

P^{10} is hydrogen or an amino-group-protecting moiety;

B^{11} is independently one of N or CH;

X^{11}, at each occurrence, is independently one of –C(O)–NH–, $–CH_2–NH–$, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –CH(OH)–CH $–NH_2$–, –CH=CH–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–, provided that when B^{11} is N, then X^{11} is –C(O)–NH;

X^{12} is one of –C(O)–NH–, –CH(OH)–CH_2–, –CH(OH)–CH(OH)–, –C(O)–CH_2–, $–SO_2–NH–$, $–SO_2–CH_2–$ or –CH(OH)–CH_2–C(O)–NH–;

R^{10} is hydrogen or alkyl, or R^{10} forms together with the adjacent R^{11}, or when A^{10} is zero, forms together with the adjacent R^{12}, a nitrogen-containing mono-, bi- or tri-cyclic, saturated or partially saturated ring system having 4-14 ring members, that can be optionally substituted by one or two of keto, hydroxy, alkyl, aryl, aralkyl, alkoxy or aryloxy;

R^{11}, at each occurrence, is independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

R^{12} and R^{13} are each independently one of hydrogen, alkyl, cycloalkyl, aryl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle or $–CH_2–R^{15}$, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted,

where R^{15} is aryl, aralkyl, alkaryl, cycloalkyl, a 5-10 membered saturated, partially unsaturated or aromatic heterocycle, or –chalcogen–alkyl, where the ring portion of any of said aryl, aralkyl, alkaryl or heterocycle can be optionally substituted;

Z^{11} and Z^{12} are independently alkyl, hydroxy, alkoxy, aryloxy, or Z^{11} and Z^{12} together form a dihydroxy compound having at least two hydroxy groups separated by at least two connecting atoms in a chain or ring, said chain or ring

comprising carbon atoms, and optionally, a heteroatom or heteroatoms which can be N, S, or O; and

A^{10} is 0, 1, or 2.

78. The method of claims 67, 68, 69, 70, 71, 72, 73, 75, 76 or 77 wherein said protesome inhibitor is one of:

N-(2-pyrazine)carbonyl-L-phenylalanine-L-leucine boronic acid,

N-(2-quinoline)sulfonyl-L-homophenylalanine-L-leucine boronic acid,

N-(3-pyridine)carbonyl-L-phenylalanine-L-leucine boronic acid,

N-(4-morpholine)carbonyl-L-phenylalanine-L-leucine boronic acid,

N-(4-morpholine)carbonyl-β-(1-naphthyl)-L-alanine-L-leucine boronic acid,

N-(8-quinoline)sulfonyl-β-(1-naphthyl)-L-alanine-L-leucine boronic acid,

N-(4-morpholine)carbonyl-(*O*-benzyl)-L-tyrosine-L-leucine boronic acid,

N-(4-morpholine)carbonyl-L-tyrosine-L-leucine boronic acid, or

N-(4-morpholine)carbonyl-[*O*-(2-pyridylmethyl)]-L-tyrosine-L-leucine boronic acid; or

isosteres, pharmaceutically acceptable salts or boronate esters thereof.

79. A method for reducing the rate of muscle protein degradation in a cell comprising contacting said cell with a compound of claim 58 or 61.

80. A method for reducing the activity of NF-κB in a cell comprising contacting said cell with a compound of claim 58 or 61.

81. A method for reducing the rate of intracellular protein breakdown comprising contacting cells with a compound of claim 58 or 61.

82. A method for reducing the rate of degradation of p53 protein in a cell comprising administering to said cell a compound of claim 58 or 61.

83. A method for inhibiting cyclin degradation in a cell comprising contacting said cell with a compound of claim 58 or 61.

84. A method of preventing or treating an inflammatory condition in a patient in need thereof, said method comprising administering to said patient a compound of claim 58 or 61.

85. The method of claim 84, wherein said patient has been diagnosed with, or is at risk of developing, a condition selected from the group consisting of tissue rejection, organ rejection, arthritis, an infection, dermatoses, inflammatory bowel disease, asthma, osteoporosis, osteoarthritis and an autoimmune disease.

86. A method for inhibiting the growth of a cancer cell, comprising contacting said cell with a compound of claim 58 or 61.

87. A method for inhibiting antigen presentation in a cell comprising administering to said cell a compound of claim 58 or 61.

88. A method for inhibiting NF-κB dependent cell adhesion in an animal comprising administering to said animal a compound of claim 58 or 61.

89. A method for inhibiting HIV replication in an animal comprising administering to said animal a compound of claim 58 or 61.